Problem 1

Write out the Chain Rule for the case where $w = f(x, y, z)$ and $x = x(u, v)$, $y = y(u, v)$, and $z = z(u, v)$

$$w_u = f_x x_u + f_y y_u + f_z z_u$$

$$w_v = f_x x_v + f_y y_v + f_z z_v$$

Problem 2

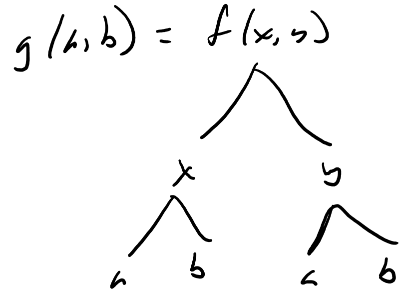
Compute w_a for $w = xy^2z^3$ with $x = t^3 + at^4$, $y = a^2t$, and $z = ae^{at}$.

$$w_a = w_x x_a + w_y y_a + w_z z_a$$

$$w_a = y^2z^3 \cdot t^4 + 2xyz^3 \cdot 2at + 3xy^2z^2\left[e^{at} + ate^{at}\right]$$

Problem 3

Suppose $g(a, b) = f(x, y)$ with $x = a^b + b^4$, and $y = e^{2a} + \tan(b^3)$. Give the formula for g_a and g_b. Compute all partials that are possible.



$g_a = f_x x_a + f_y y_a$

$g_a = f_x \cdot b a^{b-1} + f_y \cdot 2e^{2a}$

note since we do not have a formula for $f(x,y)$ we can not compute f_x + f_y

$g_b = f_x x_b + f_y y_b$

$g_b = f_x \left(a^b \ln(a) + 4b^3 \right) + f_y \cdot 3b^2 \sec^2(b^3)$

Problem 4

Find z_y for $\qquad x^4y^3 + z^2e^{2y} = 2y + \tan(4z)$

$$\underbrace{x^4y^3 + z^2e^{2y} - 2y - \tan(4z)}_{F(x,y,z)} = 0$$

$$z_y = \frac{-F_y}{F_z} = \frac{-\left(3x^4y^2 + 2z^2e^{2y} - 2\right)}{2z\,e^{2y} - 4\sec^2(4z)}$$

Problem 5

Find z_x for $\qquad x^2\sin(x^3+y^2)+yz^2=\cos(4z)$

$$\underbrace{x^2\sin(x^3+y^2)+yz^2-\cos(4z)}_{F(x,y,z)}=0$$

$$z_x=\frac{-F_x}{F_z}=\frac{-\left(2x\sin(x^3+y^2)+x^2\cdot 3x^2\cos(x^3+y^2)\right)}{2yz+4\sin(4z)}$$